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EXAMINER	
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ART UNIT	**PAPER NUMBER**
1793	

NOTIFICATION DATE	DELIVERY MODE
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary	Application No.	Applicant(s)	
	10/522,779	SAKASHITA ET AL.	
	Examiner	Art Unit	
	VANESSA T. VELASQUEZ	4116	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *28 November 2007*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,2,5 and 7-15* is/are pending in the application.

4a) Of the above claim(s) *15* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,2,5 and 7-14* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *01 February 2005* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☒ Interview Summary (PTO-413) Paper No(s)/Mail Date. *20080115*.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Election by Original Presentation

Newly submitted claim 15 is directed to an invention that is independent or distinct from the invention originally claimed for the following reasons: The method of making a titanium alloy material belongs to a statutory category of invention that is different from that of the original claims, which are drawn to a titanium alloy material. Furthermore, the product as claimed may be made by a different process.

Since applicant has received an action on the merits for the originally presented invention, this invention has been constructively elected by original presentation for prosecution on the merits. Accordingly, claim 15 is withdrawn from consideration as being directed to a non-elected invention. See 37 CFR 1.142(b) and MPEP § 821.03.

Status of Application

Claims 1, 2, 5, 7, and 8 are amended. Claims 3, 4, and 6 are canceled. Claims 9-15 are added. Claim 15 is withdrawn from consideration.

Claims 1-2, 5, and 7-14 are examined.

Personal Interview Summary Attached

A personal interview was held on November 14, 2007. A handwritten copy of the Interview Summary was distributed immediately following the interview. A typed version

of the Interview Summary (see Form PTOL-413), in which no modifications are made, is attached.

Drawing Objection Withdrawn

The Examiner wishes to withdraw the drawing objection against Figure 1 of the instant application. Figure 1 of the instant application is not identical to Figure 1 of EP 1 126 139 A2. The figure in EP '139 compares the effect of aluminum on critical rolling reduction, whereas the instant figure compares the effect of aluminum on limiting reduction.

Replacement Abstract Acknowledged

The original abstract was deleted and replaced with an abstract that is in conformance with MPEP § 608.01(b).

Amendments to Specification

The specification was amended to eliminate terms and language that rendered it unclear and inexact. It is now in compliance with the first paragraph of 35 U.S.C. 112.

Claims Amended in Response to Claim Objections

Claims 1, 4, 5, and 6 were objected to in the previous Office action. Claims 1, 5, and 6 have been amended to overcome the objections. Claim 4 has been canceled.

Claims Amended in Response to 35 USC § 112, 2nd Rejection

Claims 1-2, 5, 7-8 have been amended to comply with 35 U.S.C. 112, second paragraph. Claims 3-4 and 6 have been canceled.

Response to Arguments

Applicant's arguments with respect to claim 1 have been considered but are moot in view of the new ground of rejection necessitated by applicant's amendment. Applicant argues that "the oxide film compris[ing] aluminum," the crystallinity of the oxide, and the Ti-Al together produce a material that shows "significantly improved hydrogen absorption resistance" and that the invention is patentable because of such features and property. The arguments are found unpersuasive for the reasons stated in the 35 U.S.C. 103(a) rejection of claim 1 (below).

Applicant's arguments with respect to claims 5 and 11 have been considered but are moot in view of the new ground of rejection necessitated by applicant's amendment. Applicant argues that there is "significant improvement in hydrogen absorption resistance" due to the Al concentration layer. The argument is found unpersuasive because for the reasons stated in the 35 U.S.C. 103(a) rejections of claims 5 and 11 (below).

Claim Rejections - 35 USC § 103

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Claims 1-2, 8, and 13-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Miyamoto & Yashiki (EP 1 126 139 A2) in view of Yen (*Corrosion Science*, pp. 2031-2051, 1999), and further in view of Nakayama (JP 61276996 A).

Regarding claims 1 and 13, EP '139 teaches a titanium alloy comprising 0.5-2.3% by mass of Al, inevitable impurities, and Ti the balance (EP '139, [0009]). Although the range of the mass percent of Al in EP '139 does not encompass the entire claimed range, EP '139 still anticipates that particular claim limitation because the range taught therein falls within the claimed range.

Regarding the oxide layer, EP '139 teaches the composition of the base Ti-Al alloy, but fails to teach an oxide layer. Yen, however, teaches that oxide layers of several thicknesses (e.g., 27 nm, 37 nm, 50 nm) on commercial pure titanium (Yen, Table 3) retards the permeation of hydrogen in titanium metal. Additionally in a brief review of metal oxides, Yen discloses that aluminum oxide films have been effective at halting hydrogen embrittlement in stainless steel (Yen, Introduction, p. 2032, second paragraph).

It would have been obvious to one of ordinary skill in the art at the time of the invention to grow a thin nanometer-scale aluminum oxide on the Ti-Al alloy of EP '139. One would have been motivated to do so for two reasons: (1) Hydrogen permeation in titanium metal is decelerated by the presence of a thermally-grown oxide (Yen, Abstract, Figure 3), and (2) Aluminum oxide has been shown to retard hydrogen embrittlement of stainless steel. Although Yen does not disclose the growth of aluminum oxide on titanium alloys, the effect of aluminum oxide on steel solves the

same problem as that of the claimed invention; thus, if aluminum oxide were grown on a titanium alloy, one of ordinary skill would expect to observe the similar effect of resistance to hydrogen absorption.

Regarding crystallinity of the oxide film, EP '139 in view of Yen does not expressly teach that the oxide is crystalline. JP '996, however, teaches the formation of a crystalline oxide on titanium alloys. The crystalline oxide has excellent chemical, physical, and mechanical characteristics (JP '996, Abstract). Although JP '996 does not teach a specific percentage of crystallinity,it would be in the reach of one of ordinary skill in the art to determine percentages that will yield optimum results. (MPEP § 2144.05 IIA)

It would have been obvious to one of ordinary skill in the art to modify the oxide of Yen by growing it such that it was crystalline rather than amorphous because the highly crystalline oxide may increase the chemical resistance of the titanium alloy (JP '996, Abstract). An alloy with increased chemical resistance could be used in structures subjected to chemically harsh environments.

Regarding claim 2, EP '139 further discloses that "any alloying element other than Al ***may be incorporated*** [in the titanium alloy] so far as the feature of the present invention is not lost" (emphasis added) (EP '139, Paragraph [0009]). This statement implies that the titanium alloy of EP '139 can include some or no impurities. The ranges listed in claim 2 of the instant application embrace zero percent; thus, EP '139 reads on the features of the instant invention as described in claim 2.

Regarding claim 14, the claim is a product-by-process claim. MPEP § 2113 recites that "even though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself." The claim is directed to the titanium alloy and the oxide of claim 1, which has already been rendered obvious (see 35 U.S.C. 103(a) rejection of claim 1). In addition, the oxidizing process is well-known to one of ordinary skill in the art as evidenced by the Yen reference, in which an oxide is grown by thermal oxidation.

Regarding claim 8, the claim is drawn to intended use of the titanium alloy material. Claims drawn to intended use are not accorded patentable weight. Furthermore, as evidenced by supporting reference US 2,998,642, it has been known in the art that titanium alloys can be in contact with steel.

Alternatively, claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over Miyamoto & Yashiki (EP 1 126 139 A2) in view of Yen (*Corrosion Science*, pp. 2031-2051, 1999), and further in view of Nakayama (JP 61276996 A) and Sakiyama et al. (JP 04143235 A).

EP '139 in view of Yen further in view of JP '996 reads on all features of claim 2 as stated above; however, EP '139 in view of Yen further in view of JP '996 neither identifies particular elements nor lists acceptable amounts of impurities in the titanium alloy of his invention. JP '235 teaches a titanium alloy containing the following alloying elements: Al, Mo, Ni, and Fe (Abstract). Attention is drawn to Line 83 (JP '235 – p. 228 Table 1), wherein a sample titanium alloy contains the following elements: Al 3.0 wt%;

Mo 0.05 wt%; Ni 0.05 wt%; and Fe, 0.05 wt%. The discrete values of Al, Mo, Ni, and Fe lie within the ranges specified by claim 2 of the instant application. Although the alloying elements of JP '235 do not include Nb and Mn, the ranges in claim 2 encompass zero percent; thus, JP '996 covers all features not expressly taught by EP '139.

One of ordinary skill in the art at the time of the invention could add Mo, Ni, and Fe in the aforementioned amounts to the titanium alloy of EP '139 because they "improve the strength and workability of a titanium alloy" (JP '235 – Abstract). Sturdier and safer structures could be constructed using stronger alloys.

Claims 5, 7, and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Miyamoto & Yashiki (EP 1 126 139 A2) in view of Yen (*Corrosion Science*, pp. 2031-2051, 1999), and further in view of Nakayama (JP 61276996 A) and Dearnaley et al. (US 4,465,524).

Regarding claim 5, EP '139 in view of Yen further in view of JP '996 teaches the titanium alloy material and crystalline oxide layer; however, EP '139 in view of Yen further in view of JP '996 fails to teach a doped aluminum layer. US '524 teaches that titanium metal is bombarded with aluminum to form a doped surface layer (US '524, Col. 1, Lines 15-27).

It would have been obvious to one of ordinary skill in the art at the time of the invention to grow an oxide layer on top of the doped aluminum layer and bulk titanium alloy. One of ordinary skill in the art would have been motivated to make such a

modification because the oxide and doped layers improve the hydrogen-absorption resistance and durability of the alloy, respectively (Yen – Abstract, Figure 3; US '524 – Abstract). The presence of both layers improves the chemical and physical properties of the alloy, increasing its quality and utility in construction. US '524 may not expressly teach the advantage of hydrogen absorption resistance; however, hydrogen absorption would necessarily be an inherent property of an alloy derived from the combination of the prior art as explained above.

Regarding claim 7, US '524 does not expressly teach a thickness of the penetration layer (US '524, Item 5) containing metal atoms. However, it is within the reach of one of ordinary skill in the art to optimize such a thickness in order to obtain optimum results. (MPEP § 2144.05 II A)

Regarding claim 11, US '524 does not expressly teach a concentration of aluminum atoms in the penetration layer (US '524, Item 5). However, it is within the reach of one of ordinary skill in the art to optimize such a thickness in order to obtain optimum results. (MPEP § 2144.05 II A)

Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Miyamoto & Yashiki (EP 1 126 139 A2) in view of Yen (*Corrosion Science*, pp. 2031-2051, 1999), and further in view of Nakayama (JP 61276996 A) and Yao et al. (US 6,066,359).

Regarding claim 9, EP '139 in view of Yen further in view of JP '996 fails to teach a crystalline oxide comprising Brookite. US '359 teaches the formation of titanium oxide

on a substrate (US '359, Abstract). The substrate may be metal (US '359, Col. 5, Lines 1-6), and the oxide may be of the Brookite structure (US '359, Col. 3, Lines 23-26).

The Brookite structure of titanium oxide is known in the art as evidenced by US '359. Furthermore, the oxide has been shown to be resistant to corrosion (US '359, Abstract); thus, one of ordinary skill in the art would be motivated to grow an oxide of the Brookite structure on a metal alloy to protect the alloy from corrosion and arrive at the claimed invention. In addition, US '359 does not expressly teach the advantage of hydrogen absorption resistance. However, hydrogen absorption would necessarily be an inherent property of an alloy derived from the combination of the prior art (see 35 U.S.C. 103(a) rejection of claim 1 above).

Claims 10 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Miyamoto & Yashiki (EP 1 126 139 A2) in view of Yen (*Corrosion Science*, pp. 2031-2051, 1999), and further in view of Nakayama (JP 61276996 A), Dearnaley et al. (US 4,465,524), and Yao et al. (US 6,066,359).

Regarding claims 10 and 12, EP '139 in view of Yen and further in view of JP '996 and US '524 teach a titanium material comprising a Ti-Al alloy, Al concentration layer, and crystalline oxide, but fail to teach that the crystalline oxide has a Brookite structure. US '359 teaches the formation of titanium oxide on a substrate (US '359, Abstract). The substrate may be metal (US '359, Col. 5, Lines 1-6), and the oxide may be of the Brookite structure (US '359, Col. 3, Lines 23-26).

The Brookite structure of titanium oxide is known in the art as evidenced by US '359. Furthermore, the oxide has been shown to be resistant to corrosion (US '359, Abstract); thus, one of ordinary skill in the art would be motivated to grow an oxide of the Brookite structure on a metal alloy to protect the alloy from corrosion and arrive at the claimed invention. In addition, US '359 does not expressly teach the advantage of hydrogen absorption resistance. However, hydrogen absorption would necessarily be an inherent property of an alloy derived from the combination of the prior art (see 35 U.S.C. 103(a) rejection of claims 1, 5, and 11 above).

Conclusion

Claims 1-2, 5, and 7-14 are finally rejected.

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of

the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to VANESSA T. VELASQUEZ whose telephone number is (571)270-3587. The examiner can normally be reached on Monday-Friday 7:30 AM-5:00 PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Vickie Kim can be reached on 571-272-0579. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Vanessa T Velasquez/
Examiner, Art Unit 4116

/Vickie Kim/

Supervisory Patent Examiner, Art Unit 4116

VICKIE Y KIM
SUPERVISORY PATENT EXAMINER

Drawing objection will be reconsidered and withdrawn.

Emphasis of synergystic effect of crystallinity and Brookite and Al concentration.

Claim 5 - "Al concentration layer" discussed.

Applicant will file amendments based on our discussion.